c.—THERAPEUTICS OF THE NERVOUS SYSTEM AND MIND.

THE ACTION OF ANÆSTHETICS ON THE RESPIRATION AND HEART.—We take the following from the *Union Médicale* of June 8:

"We give *in extenso* the very interesting communication read by M. Vulpian to the Academie des Sciences, on the action of anæsthetics (sulphuric ether, chloroform, chloral hydrate) on the respiratory centre and the cardiac ganglia.

"The experiments of E. H. Weber have shown that, in an animal whose two pneumogastric nerves have been divided in the neck, the faradization of the peripheral or thoracic segments of these nerves, even with a current of moderate intensity, causes a suspension of the cardiac movements. We know also, since the researches of Traube, that a sufficiently energetic faradization of the superior, cephalic, extremities of these nerves, causes an immediate arrest of the respiratory movements. These facts, which are very interesting, have been studied in their lesser details by various physiologists. The experiments of Weber and of Traube may be repeated on animals that have not undergone any previous intoxication; we have ordinarily performed them on animals curarized, or under the influence of morphine, or anæsthetized by ether, chloroform or chloral.

"If we practice faradization of the peripheral segments of the pneumogastric nerves in a curarized animal, we observe, in a general way, as all the experimenters have done, the same effects as in an animal not poisoned. The heart is flaccid, arrested in paralytic relaxation, and after a few seconds it gradually begins again to contract, even while we hold the electrodes in contact with the nerves. The effects of the faradization of the peripheral segments of the pneumogastric nerves are nevertheless not absolutely identical in curarized and non-curarized mammals. While in the latter we can arrest the heart by electrizing only one pneumogastric, in the curarized mammal it can be caused only a little as the intoxication is pushed; on the other hand, the so-called diastolic arrest of the heart lasts a less time when the faradization is prolonged than in a non-curarized animal. If the curarization is profound there is a period during which the strongest faradization does not arrest the heart, nor even slow it; the only effect observed even is an acceleration of the organ.

"These are well known facts, showing that previous curarization, a procedure often employed to render the animal experimented upon immovable, does not leave intact, in mammals, the cardiac extremities of the pneumogastrics, a fact not in accordance with what was believed at the beginning of the study of this poison.

"The anæsthetics, *i. e.*, ether, chloroform, and chloral, which we also very frequently employ to render animals insensible, without destroying the motricity of the nerves, also modify in a certain way, different from the preceding one, the effects of the excitations of the peripheral portions of the divided pneumogastrics; and they also influence, in fully as manifest a manner, the effects of the excitation of the superior or cephalic portions of these same nerves.

"I take, for example, chloral hydrate, often employed at the present day in physiological laboratories in the form of intravenous injections. When we inject into a vein (the saphenous vein, for example) of a dog, a watery solution of chloral hydrate of the strength of one-fifth, and in quantity sufficient to produce deep sleep, we cause also a complete anæsthesia, on the characters of which I need not dwell. I should rather confine myself to the point that furnishes an explanation for the fact to which I desire to call attention. In chloralized animals the movements of the heart persist, and the same is the case with the spontaneous respiratory movements. All the physiologists who employ this convenient method of previous anæsthesia in their various experimental researches, have observed that in certain cases, not infrequent, especially when the intravenous injection is not performed slowly and gradually, the dogs (and other animals also) cease abruptly to respire, after a certain amount of the chloral has entered the circulation. It is a sort of respiratory syncope that is thus produced, and usually the cardiac movements are not simultaneously arrested; they go on still for one or two minutes or even for a longer time. The spontaneous respiratory movements may usually be revived by keeping up artificial respiration by means of repeated pressure on the thorax, and, still better, by faradization of the trunk. To apply this faradization, we apply one electrode to the face or neck, and the other to the base of the chest, or the subthoracic part of the abdomen. It produces instantly an inspiratory movement; we interrupt the current and the parts come again to rest, thus effecting expiration, and we repeat these some fifteen or twenty times in a minute. Artificial respiration, effected in this way, keeps up the heart's movements, up to the time when the bulbar centre retakes its function. Sometimes this result is only attained after eight or ten minutes of artificial respiration practiced as described. I have seen a dog only begin to respire spontaneously after twenty-two minutes of artificial respiration by constantly repeated thoracic pressures, and the instantaneous faradization I have described twenty times a minute. In some cases all means are inefficacious, the heart comes to a stop and the animal dies.

"Sometimes this sort of respiratory syncope does not occur when we inject chloral into the veins, nor for some seconds after; it is at the end of some minutes that the respiration ceases abruptly, sometimes without recognizable cause, sometimes when an experiment is begun, and probably under the influence of this or that traumatic irritation. The same means are necessary to re-establish spontaneous respiration.

"Effects of the same kind may be produced in animals anæsthetized by ether, chloroform, or other analogous substances.

"On the other hand, one other accident may occur in chloralized dogs, and this accident is most often irremediable. The heart may be arrested more or less suddenly, either directly during the injection, or subsequently during the performance of some experiment involving the sensory nerve fibres. The heart stops before the respiration, the respiratory movements ceasing a few seconds later. It is rare that faradization, even when applied as soon as the disappearance of the arterial pulse is discovered, recalls the functions of the heart.

"This arrest of the heart, this *cardiac syncope*, is also seen in animals under the influence of chloroform or ether, and it certainly is more readily produced in animals who are stupefied by the anæsthetics in question, during vivisection, than in those who have undergone no previous intoxication or who are paralyzed by curare. In these the weakened state of the inhibitory action of the vagi is undoubtedly a condition which renders the reflex excitation of these nerves less dangerous.

"It follows from these preliminaries that in anæsthetized animals, and especially in those that are chloralized, the respiratory centre undergoes notable modifications. The increase, though slight, of the amount of chloral in the circulation, may suspend the function of this centre. It may also lose its function under the influence of more or less irritative causes, either arising in such or such organ, or produced during the performance of vivisections. On the other hand, the excitor ganglia of the movements of the heart may be paralyzed, under the same circumstances, when there is either an excessive quantity of chloral injected, or when the traumatic irritations of vivisection provoke the inhibitory functions of the cardiac fibres of the vagi into action.

"But, if we repeat on dogs profoundly under the influence of chloral, the experiments of E. H. Weber or of Traube, we observe the following :

"Faradization of the superior, cephalic, segments of the divided vagi, arrests the respiratory movements, as in animals not anæsthetized ; but, while in the latter the respiration resumes spontaneously and naturally, in the great majority of cases, despite persistent electrization, it cannot be revived in the chloralized animals, and they die, unless we make haste to suspend the electrization of the vagi and make use of artificial respiration, either alone, or with the aid of faradization of the trunk, energetically applied for a moment and repeated every three or four seconds.

"Frequently it suffices to faradize the cephalic sections of the vagus for a few seconds (3–10) to cause an arrest of respiration, and this may be fatal unless resort is had to artificial respiration and faradization, contractions of the trunk, which act at the same time in producing inspirations of a certain amplitude, and waking up the nervous centres from their profound stupefaction.

"We, therefore, obtain readily, and very frequently, in these conditions, under the influence of faradization of the superior segments of the divided vagi the same effect that M. Bert had sometimes observed in non-chloralized animals, *i. e.*, sudden death, unless artificial respiration is resorted to.

"It is worth while to say here, that if we repeat the experiment many times on the same dog, we do not obtain the same result as when we repeat it only two or three times ; it becomes impossible to produce the arrest of respiration with impending death. The respiratory movements revive spontaneously after a greater or less time, although faradization of the upper extremities of the vagi is continued.

"If, under the same conditions of complete chloralization, we submit the lower segment of the divided vagus to a jerky induced current, we find the arrest of the heart in diastole, as in non-anæsthetized animals, but also (what is rarely seen except under these conditions) that it may cease definitively if the faradization is prolonged. We find, moreover, that this permanent arrest of the cardiac movements does not usually occur if we suspend momentarily these movements two or three times by the aid of the faradic current, before submitting the cardiac segments of the vagi to prolonged electrization.

"These facts are not without interest as regards the physiological study of anæsthetics; they may, also, contribute to the explanation of certain accidents of clinical anæsthesia, hence I have communicated them to the Academy."

ETHER IN SCIATICA.—Dr. C. G. Comegys, *Lancet and Clinic*, July 6, recommends the hypodermic use of common (sulphuric) ether in sciatica. He mentions two cases, one in detail, of this affection cured by this treatment. The injections were superficial, not deep, and though causing severe pain for a time, left no ill effects. He thinks one dose sufficed for a cure in one of his cases, and believes that the remedy will be equally effective in tic douloureux.

IPECACUANHA AND ITS ALKALOID.—The following are the conclusions of an article, by Dr. John K. Foulkrod, in the *Philadelphia Med. Times*, Aug. 31, on the Physiological Action of Ipecacuanha and its Alkaloid. His experiments were performed on cats, dogs, rabbits, mice, and frogs.

1. When locally applied, emetia produces a progressive loss of functional power of the nerves and striated muscles. If such contact be continued even but for a short time, the tissues do not recover.

When directly applied to the brain and spinal cord, no action is manifest.

2. The fall in the arterial pressure produced by an injection of emetia is caused by the direct action of the drug upon the heart,—*i. e.*, by cardiac paralysis.

3. The movements of the heart are first accelerated and afterwards diminished by the action of emetia; the diminution in the frequency of the heart's movements is due to cardiac paralysis.

4. Emetia paralyzes the cardiac inhibitory fibres of the pneumogastrics.

5. The sleep and coma produced by the drug are due to its action on the brain.

6. The emetia convulsions are spinal in their origin. The abolition of reflex activity is also due to the action on the spinal cord.

7. The vomiting produced by emetia is due to a local action on the stomach,

8. The drug produces slowing of the respiratory movements; the slowing still occurs after the pneumogastrics are cut.

9. The voluntary muscles escape unscathed in emetia-poisoning; their contractility, however, may be destroyed by painting with a solution of the alkaloid.

10. Emetia is absorbed and is eliminated unchanged by the kidneys; it is also eliminated by the gastro-intestinal mucous membrane.

11. The salivation induced by emetia is due to its local action on the nerves in the mouth.

The introduction of emetia into the stomach subcutaneously, or into a vein is followed by albuminuria.

Glucose is found in the liver after poisoning by ipecac.

12. Emetia has no direct action on the blood.

13. Emetia has no action on the pupil, either when the drug is applied locally or introduced into the general circulation.

Ammonio-Sulphate of Copper.—In the *Bull. Gen. de Thérapeutique*, Aug. 15, M. Fereol, of the Hospital Lariboisiere, gives an account of a case of epileptiform neuralgia, the attacks occurring many times a day, and nearly driving the patient to insanity. There was complete insomnia; the nerve involved was the trigeminus, and all the divisions on the left side were implicated. Aconitine and gelsemium, the two remedies most recently recommended by M. Gubler, were faithfully tried, but without effect. On the recommendation of M. Davaine, *interne*, who had seen good results follow its use in the service of M. Bourdon, the ammonio-sulphate of copper was employed, in doses at first of five centigrammes (=¾ grain) with the happiest results, complete relief being obtained in less than ten days of the treatment.

Aconite.—At the session of the Soc. de Biologie, July 6 (rep. in *Gaz. des Hopitaux*), M. Laborde presented a communication in which he attempted to show that it was from failure of the lungs and not of the heart, that death occurred in aconite poisoning. Hence, according to this mode of view artificial respiration should be considered as the best antidote to aconite.

The following are the conclusions as to the action of aconite on the nervous system, of an article by Dr. G. H. Mackenzie, in the *Practitioner*, February, March, and April of the present year. He used, besides the alkaloid, tinctures in his experiments, which were performed on dogs rabbits and frogs.

1. *It induces paralysis of the peripheral sensory nerves, the sensory nerve trunks, and posterior (sensory) nerve-roots.* The evidences of this are witnessed in the progressive diminution of power of conduction of the afferent nerves, commencing at the periphery, and subsequently extending along the nerve-trunk to the nerve root. To this sensory paralysis is probably due the ataxic gait, inco-ordinate movements, and diminished power of locomotion in aconitized animals. There is reason to believe, however, that paralyzation is not the primary effect of the action of the drug on the sensory nerves, but that it is preceded by a period of hyper-excitation or irritation. This feature is especially prominent in dogs, which, during the early stages of aconitism, give evidence of considerable cutaneous irritation, especially

in the posterior limbs. The primary stage appears to be of uncertain duration, and during its continuance, reflex action seems normal. It may be the only sensory effect produced (mild aconitism), and may with safety be induced therapeutically.

2. *The irritability of the motor nerves is augmented.*—That this is the case is shown from their excitability being invariably of greater intensity and longer duration in the aconitized frog, when tested with another in its normal condition. The poisoned motor nerves of a batrachian also show greater irritability than those protected by ligature from the action of the drug. The degree of motor-nervous irritability present in aconitism may be summarized as comprising three stages : (1.) Primary hyper-excitation ; (2.) exhaustion, the result of the first stage ; (3.) secondary hyper-excitation. These results were obtained after repeated experimentation, and are directly antagonistic to those arrived at by Achscharumow, whilst they confirm to a certain extent those of Boehm and Wartmann, with this distinction, that the latter believed the excitability of the nerves and muscles in aconitism to be perfectly normal.

3. *The cerebro-spinal axis is variously affected, the functions of the cerebrum being unimpaired, the posterior (sensory) columns of the cord being also unaffected, and the anterior (motor) columns having their irritability greatly increased.*

As already stated, the author has been unable to detect cerebral paralysis as one of the conditions obtaining in aconitism, but, on the contrary, has invariably observed such an amount of intelligence present, even during the most profound stages, as to forbid the idea that it can be present to any great extent. He is not inclined, therefore, to agree with the idea of Liegois and Hottot as to the paralyzation of a perceptive cerebral centre. The absence of paralysis of the cerebral motor centres is indicated by their ready muscular response on electrical and mechanical stimulation. From the fact that the posterior columns of the cord maintain their normal irritability after the paralyzation of the sensory nerves and sensory nerve roots, and that the degree of muscular movement induced by their excitation is about as great as by the direct irritation of the muscles themselves, it is evident that in aconitism their condition is one of non-paralyzation. The sensory paralysis present, therefore, is apparently of a non-spinal nature, both in its primary manifestation and ultimate development. The condition of the motor columns of the cord is one of hyper-excitation, as demonstrated by the greatly augmented severity of the convulsions on the cord being released from the control of the inhibitory centre by section of the medulla, by their idiopathic occurrence and general nature. Intermittent convulsive spasms invariably follow the administration of the tincture in poisonous doses, whilst hypodermic injections of strong solutions of the alkaloid frequently do not markedly induce them.

The author is unable to account for the statement of Boehm and Wartmann (already quoted), that increased reflex action does not occur in frogs poisoned by aconite, when released from the control of the inhibitory centre, for he has invariably found excessive muscular action to be the result of the above operation in aconitized frogs. This effect has been so frequently obtained by him as to place its existence beyond doubt, and he can only conclude that the authors above named had used spurious preparations of the alkaloid in their experiments.

The absence of motor phenomena spoken of by Wood as being especially common in dogs, can only be accounted for in the same way. In the present series of experiments it was noticed that the administration of the alkaloid was not followed by such precise effects as characterized the exhibition of carefully prepared tinctures, doubtless owing to the presence of some impurity or pseudo-alkaloid.

The following are the summarized conclusions as given as to the action of aconite on the respiration:

1. Its effect on the respiration is primary, and due to the direct action of the drug on the sensory fibres of the vagus, and the respiratory centre.
2. It induces a series of symptoms closely resembling those developed after section of the vagi.
3. It causes death partly by asphyxia, and partly by the variety of collapse spoken of by Brown-Séquard, as "characterized by a great diminution of breathing, produced by a peculiar influence on the central organs of respiration, the heart continuing to beat with more or less vigor."

ALCOHOL AS AN ANÆSTHETIC.—The following is a short communication by Alexis Horvath (of Kieff) in the *Gaz. des Hopitaux* No. 105, Sept. 10, 1878 :

Knowing the painful sensation experienced by immersion of the hand in water at a temperature of 0. Cent., I was much astonished to not experience the same sensation with the hand in alcohol, the temperature of which had been reduced to—5° Cent.

The discovery of this curious fact, which was made by me as early as 1869, led me to undertake some experiments, of which I give briefly the results.

When the finger is held in sulphuric ether or mercury at the temperature of—3° C. the same painful sensation is experienced as when it is immersed in water at zero C.

On the other hand, when we plunge the finger, even for a longer time, into alcohol or glycerine at the temperature of—5° C. we feel no pain.

A prick in the finger, while it is immersed in cold alcohol, produces no pain, and only a sensation of contact, thus proving that there is a distinction between the sense of tact and that of pain, and affording us the means of proving it. It is seen thus that pain is not the sense of tact intensified, but rather an altogether different sensation.

These experiments demonstrate that it is not merely the cold that plays a part in the production of anæsthesia, but also the liquid employed ; in this regard the various liquids act differently. Inasmuch as death following severe burns is partly attributed to the intense pain which accompanies them, I was led to utilize alcohol in their treatment. I have had numerous occasions to recognize its efficaciousness ; among others in a child burnt in the hand (to the second degree); the pains disappeared at once on plunging the hand into alcohol, to reappear again on its withdrawal. Moreover, I observed that burns submitted to this treatment were cured in much less time than those treated otherwise.

Anæsthesia by cold (according to the methods of Richardson, etc.), though known and appreciated for a long time, is relatively little employed, solely on account of the inconveniences of the procedure. These inconveniences, joined to the above observations, have led me to attempt a work on anæsthesia by cold in grand operations, and in extensive burns located elsewhere than in the extremities.

VERATRUM VIRIDE IN EPILEPSY.—E. F. Mordough, *N. Y. Med. Record*, Sept. 14th, 1878, uses hypodermic injections of large doses (10–15 minims) of the tincture of veratrum viride in combination with morphiæ to abort recurring convulsions of epilepsy. The formula of his combination is :

℞
Morphiæ Sulph. - - gr. iss.
Tr. Veratrum Viride
Aquæ distill. - - - *aa* ℥ ss.
M.

No unpleasant effects, he states, followed the injections, the morphiæ in every instance counteracting the nauseous emetic effect of the veratrum.

THE CONSTITUENTS OF COFFEE.—C. Binz, *Arch. f. exper. Pathol.*, IX. 31. (Abstr. in *Centralbl. f. Wissensch.*) In a former examination of the secondary quinine products, the author discovered that caffein had an entirely opposite effect from quinine as regards its action on the bodily temperature ; 0.7 gramme caffein, injected subcutaneously in two places into a powerful dog, increased the temperature almost 1° C. within an hour, without the animal's exhibiting any signs of poisoning. He followed up this experiment and found, after moderate doses of caffein (0.2 gramme) hypodermically administered to a dog, a rise of 0.3° C., after larger doses (0.5 gramme), one of 1.4° C., and all without any appearance of stiffness of the muscles, or otherwise "increased innervation" or any other kind of abnormality in the animal. Larger doses likewise caused increase of temperature, but soon produced death in convulsions. Curare and artificial respiration, or the latter alone, counteracted the effect of caffein. Besides this the author found that caffein in moderate doses increased the blood pressure ; the dogs which served for the kymographic experiments were only narcotized by alcohol, neither curare nor artificial respiration were employed. That this increase of blood pressure was not dependent on any action of the vagus, was proved by the fact that after previous section of both vagi, with hypodermic injection of caffein, a rise occurred which was independent of the after effects of the vagus section.

In order to learn the action of caffeon—this is the name given by Boutron and Frémy to the transient rust product of the burnt beans, which has been isolated as an ætherial oily substance by shaking up the distillate with ether —the author made a distillation of an infusion of coffee (20 grammes burnt coffee and 150 grammes hot water) and found the same like caffein, in small doses an excitant to the brain, the heart, the respiration and the temperature.

He agrees with Hoppe-Seyler and Voit that the use of coffee infusion or of caffein itself in dietetic doses has for a result a diminution of tissue metamorphosis, the distinction being so slight that further preliminary conclusions thereon are as yet not practicable.

The author deems that any influence on the organism worthy of mention of the potash salts is not probable.

The following are a few of the recently published papers on the Therapeutics of the Nervous System and Mind:

MASING, Nerve-Stretching, *St. Petersburg. med. Wochenschrift*, No. 34, 1878; LESSER, On the Physiological Action of Arsenious Acid, *Virchow's Archiv*, LXXIII., 3, July, 1878; FUNAIOLI, On the Therapeutic Virtues of Bromide of Camphor, *Archivio Italieno*, September; TOSELLI, The Aqueous Extract of Secale Cornuta in the Treatment of Mental Diseases, *Ibid;* HUSEMANN, The Method of Bivine in the Treatment of Strychnia Poisoning, *Deutsche med. Wochenschr.* (cont. art.); SKILLERN, Combination of the Alkaloids of Cinchonia with Morphia, *Phil. Med. Times*, September 28; SINKLER, Cannabis Indica in the Treatment of Epilepsy, *Ibid*; ROBERTS, Chloral in the Treatment of Traumatic Tetanus, *Med. and Surg. Reporter*, September 14; MILLS, Massage and Swedish Movements in the Treatment of Diseases of the Nervous System, *Ibid;* STOLNIKOW, On the Alterations of the Cutaneous Sensibility in Healthy Men by Cold and Warm Baths, *St. Petersburg. med. Wochenschr.*, No. 26; RINGER and MURRELL, On Gelsemium Sempervirens, *Lancet* (Am. Rep.), Sept.